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THE RELATIONSHIP BETWEEN ANIMAL WASTES
AND WATER QUALITY. A REPORT OF RECENT
MEETINGS, OCTOBER 1971 AND JANUARY 1972

President's Water Pollution Control Advisory
Board
Washington, D. C.

1972

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between
ANIMAL WASTES
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WATER QUALITY**

- A Report to the Administrator of the
Environmental Protection Agency of
recent meetings held by the President's
Water Pollution Control Advisory Board

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ENVIRONMENTAL PROTECTION AGENCY
Washington, D.C. 20460

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INTRODUCTION

The President's Water Pollution Control Advisory Board was authorized by Section 9 of the Federal Water Pollution Control Act of 1956.

The Board's mission is to advise, consult with and make recommendations to the Administrator of the Environmental Protection Agency on matters of policy relating to water pollution control. Under this authority the Board regularly examines all phases of the national water pollution problem and from time to time holds public meetings to hear the views of individual citizens, various levels of government and private agencies and groups.

There are nine members, appointed by the President who serve three years each. The chairman is the Administrator of the Environmental Protection Agency, and the Secretary of the Department of Health, Education, and Welfare, is an ex officio member. Three of the appointive terms expire each June 30 or at such time thereafter as successive appointments become effective. No member may succeed himself within one year of the date his term ends.

The Advisory Board holds four to six meetings a year. Usually two of these are held in Washington, D. C. for the purpose of reviewing clean water plans, policy and progress with the EPA Administrator. The other meetings are held in various regions of the country at the call of the Chairman, or at request of individual Board members or a State governor who feels that a particular water pollution problem should have the Board's attention. The regional meetings serve, first to inform the Board members on the various types of water pollution problems and control programs that exist throughout the Nation. Also, because they are open to the public, the regional meetings focus public attention on particular city, State or regional problems and stimulate action for pollution control in problem areas under review.

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ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF THE
ADMINISTRATOR

May 16, 1972

Dear Mr. Administrator:

The President's Water Pollution Control Advisory Board met October 26-29, 1971 in Denver, Colorado and at various sites in Illinois and Indiana, January 24-28, 1972 to review the relationship between animal wastes and water quality throughout the United States. The Denver meeting addressed itself to the problem in the States west of the Mississippi River while the Illinois-Indiana session covered States east of the Mississippi. As part of its study, the Board also toured agricultural areas in Colorado, Nebraska, Kansas, Indiana, and Illinois and conducted public meetings to receive testimony from experts and interested citizens representing a cross section of the Nation. In addition, the Board considered recommendations developed by a National Symposium on Animal Waste Management at Warrenton, Virginia on September 28-30, 1971 and by workshops conducted by several academic institutions. Accordingly, the Board's findings and recommendations (Appendix 4) to you are based upon information from this wide variety of sources. This report is a summary of the two meetings held on the animal waste problem. Complete statements made by the speakers at the public meeting as well as any additional information may be obtained from the Executive Secretary of the President's Water Pollution Control Advisory Board located at 1750 K Street, N.W., Room 1017, Washington, D.C. 20460.

FIRST MEETING, OCTOBER 26-29, 1971, DENVER, COLORADO

TUESDAY, OCTOBER 26, 1971

The meeting was convened by Mr. William Erwin, Special Consultant to the Administrator, EPA on Rural Affairs and Acting Chairman for this Board meeting. Board members present were: Dr. Melbourne R. Carriker, Woods Hole, Massachusetts; Mr. William D. Farr, Greeley, Colorado; Mr. Ray W. Ferguson, Ontario, California; Dr. Wallace W. Harvey, Jr., Manteo, North Carolina; Mr. Byron P. Jordan, New Orleans, Louisiana; Mr. Irvan F. Mendenhall, Los Angeles, California; and Mrs. Samuel Rome, River Forest, Illinois. Not present were: Mr. Parker E. Miller, North Redington Beach, Florida and Mr. Thomas W. Gleason, New York, New York. Acting as special consultant to the Board was former member, Louis S. Clapper, Conservation Director, National Wildlife Federation, Washington, D. C.

After introduction of guests, Mr. John A. Green, EPA Regional Administrator, Region VIII, welcomed the Board and presented an overview of environmental problems resulting from agricultural activities in his region covering the States of Colorado, Utah, Wyoming, Montana, and North and South Dakota. He pointed out that in all of these States far less than half the population is engaged in agriculture and that the types of agriculture and resulting environmental problems are very dependent on geography and climate. Mr. Green briefly summarized the major types of agricultural impact that can be expected to occur in his region, as follows:

- (1) In the eastern Dakotas where there is more rainfall, the problems are more typical of those in the east, such as sedimentation and fertilizer runoff.
- (2) In areas where there is extensive irrigation, such as the Souris, the South Platte, the Arkansas, and the Colorado Rivers, irrigation return flow and salinity are problems.
- (3) Pesticide use is controversial, particularly when it involves predator control and public lands.
- (4) There is a question of overgrazing on public land by sheep where serious problems can result.

Mr. Carl Clopeck, Assistant for Congressional and Intergovernmental Relations, EPA Region VII presented an overview of environmental problems resulting from agricultural activities in that Region. Region VII is comprised of the States of Iowa, Missouri, Kansas, and Nebraska. Mr. Clopeck noted that most of the industry in these States is agriculturally related and that groundwater plays an extremely important role in the development of the region. He stated further that sediment with associated chemical attachments is the most significant stream pollutant in Region VII. Cattle feedlots are an important pollution source

especially in the large lots which drain to the tributary streams emptying into the Missouri River. Mr. Clopeck indicated that Kansas was a leader in controlling the problem instituting regulations in 1969. Iowa and Nebraska now have regulations and Missouri is on the verge. The real problem now is to implement a plan of action and generally effective control is expected by 1973. Mr. Clopeck concluded by emphasizing that good research has already been accomplished to find simple, effective and inexpensive methods; that EPA and USDA have joint demonstration projects which promote the practice; and that Federal programs to control agricultural pollution already exist.

Mr. Charles W. Murray, Acting Director, Air and Water Programs Division, EPA, Region VIII discussed the impact of agricultural activities on water resources. Mr. Murray said animal wastes have become a growing threat to clean streams over the past 20 years with the national trend toward agribusiness, especially in the growth of vast feedlot operations for cattle. During 1970, he said, 2,242 U. S. cattle feeding operations had 1,000 or more head of cattle at any one time, and some were so vast that 1 percent of the nation's feedlots produced 55 percent of the grain-fed cattle marketed during 1970. The result has been major problems in management of the large volumes of waste generated. Mr. Murray emphasized that the river pollution threat is less serious in the arid west than in the midwest, where frequent cloudbursts wash massive slugs of organic waste from feedlots into river basins. Rich in ammonia, bacteria, and the antibiotics and hormones fed to cattle, such feedlot runoff is 10 to 100 times more concentrated than raw domestic sewage, Mr. Murray told the Board. Besides the impact this has on flowing streams, he said there is evidence that runoff percolates into groundwater under certain conditions. Shallow aquifers in sandy soil near some feedlots have been found to contain 100 parts per million of nitrates, much higher than the 45 parts per million considered a safe maximum for well-water purposes, Mr. Murray said.

Mr. Lawrence Gazda, Acting Director, Categorical Programs Division, EPA Region VIII, briefly summarized the non-water related environmental effects of agricultural activities. Included in these problem areas are solid waste management, air pollution, vector control, pesticides and land use. During the highlights of Mr. Gazda's presentation he emphasized that one of the major air pollution problems associated with agriculture is odors from animal feedlots. This problem is the one most apt to bring public pressures on the feedlot owner and is accentuated by poor land use practices, including the inadequacies of the buffer zones set up by agricultural enterprises, Mr. Gazda stated.

The final presentation of the Board's morning session was a summary of institutional and legal problems and future trends by Mr. Donald Dubois, Deputy Regional Administrator, EPA Region VIII. Mr. Dubois explained that the agricultural industry is a very diffuse one with millions of

independent operators and no single organizational entity to work with. In addition, the farmer maintains a certain mistrust of government interference with his work. He pointed out that existing environmental legislation is not geared to diffuse sources like agriculture and the almost impossible task of identifying various non-point source pollution problems so as to initiate court action. Mr. Dubois continued by explaining western water law and the implications that it has in terms of water pollution control and environmental quality. In the West there is a water shortage which leads to many environmental conflicts. Mr. Dubois mentioned the negative aspects of the great growth of individual farms e.g., with intensive larger operations comes more water use, more possible groundwater problems, and perhaps, more salinity, also more intensive use of chemicals and more concentrated waste sources. On the positive side, he stated bigger operations are better financed; they are more likely to employ up to date technology; and are apt to have a better awareness of the problem. On the institutional side, Mr. Dubois mentioned land use as an important aspect and the question of preserving prime agricultural lands from being used up for cities, industries, highways, and airports. Mr. Dubois concluded by suggesting some possible directions to alleviate some of the problems discussed. First, existing technology might be applied right now and not wait until all research has been completed; second, environmental education must be built into the agricultural community; and finally, it is important that the agricultural agencies, especially those in close contact with the farmer, such as the extension service emphasize the **importance of environmental preservation**. It is important that EPA recognize existing organizations and work through them.

INSPECTION TOURS - TUESDAY, OCTOBER 26, 1971

On the afternoon of October 26, the Board conducted a field inspection tour in the Greeley, Colorado area to view large cattle feedlot operations at the Farr Farms feedlot and the Monfort feedlot, the world's biggest cattle feeding facility. At both farms the Boards saw examples of feedlots employing modern pollution control practices. For example, at the Farr Farms, 14,000 head of beef cattle are confined in feeding pens on each bank of the Cache La Poudre River. An extensive system of drainage ditches, pipelines and three retention lagoons prevent liquid runoff from reaching the Cache La Poudre. There is also a manure recycling operation, in which solid wastes are removed from each pen with a road-grader every month and sold to produce grain for Mr. Farr's cattle-feeding operation. Acting Chairman, William Erwin, pointed out that such retention lagoons would have to be considerably larger to work effectively in States with greater rainfall.

WEDNESDAY, OCTOBER 27, 1971

The Board spent the day observing feedlot operations in Nebraska and Kansas. The day began with a flyover trip whereby the Board was able to view hundreds of miles of the South Platte and North Platte River valleys of Colorado and Nebraska on the way to Omaha. The Board received a close-up view of the heavily irrigated corn, grain sorghum and alfalfa areas along the Platte, with a later view of the Kansas Bluestem ranches and feedlots along the Cottonwood River.

Two lots were visited at Springfield, Nebraska just outside of Omaha. Dr. W. E. Splinter, Chairman of the University of Nebraska Agricultural Engineering Department acted as tour guide. He told the Board members that within the past year, a cooperative feedlot waste program has made measurable gains in feedlot water pollution. At the first lot visited Leo Timmerman and Sons, Board members viewed a confinement building in operation which processes in excess of 40,000 cattle. Of primary interest was the 304 foot long structure with a slotted floor through which waste drops into waterpits where solids are decomposed and the resulting liquids are then funneled into a holding lagoon.

At the Bill Cockerill lot the Board viewed another well controlled feeding operation consisting of diversion ditches, broad base terracing, and a holding pond. The wastes from the holding pond are recycled onto cropland. On the edge of Springfield was the Zinnerman Feed Yard where housing is apparently destined to completely encircle it and public pressure likely eventually to force its abandonment. The Advisory Board was also told by tour officials, that Nebraska's 19,000 feedlots will be required by law to halt all pollution runoff from their property by the end of 1972.

Water pollution control structures were observed as the plane circled the Flint Hills Feed Yard and other lots enroute to Pratt, Kansas. There George Chandler and Manager Frank Smith of the Pratt Feed Yards conducted a tour which revealed the big settling basins for feedlot runoff and the pumping arrangements draining the basins for irrigation of nearby land. The problem here was that heavy applications of the concentrated liquid effluent were shown to actually cut crop production. The solution planned is to cover more land and to dilute the application with water.

THURSDAY, OCTOBER 28, 1971

The Board held a day long public hearing in Denver to hear testimony from Federal and State agencies, conservation groups, agribusiness representatives, and academic individuals who presented statements

on the animal waste - water pollution problem. The Board also held an open public form in the evening to hear statements from interested citizens and several other organizations.

The morning session was opened by Acting Chairman, Gary H. Baise, who swore in two new Board members: Mr. Byron P. Jordan, New Orleans, Louisiana and Mr. Irvan F. Mendenhall, Los Angeles, California. Mr. Baise then explained the purpose of the meeting emphasizing that the Board has no preconceived conclusions and is primarily interested in seeking information and advice on animal wastes as related to water pollution.

This was followed by a welcome to the Board by Governor John A. Love of Colorado who stated that Colorado has 4 major river systems where the quantity and quality of the water are entirely different. He pointed out potential pollution problems from the increased number of campers and trailers in the State, and discussed problems caused by industrial wastes and old mines. He concluded by assuring the Board that Colorado has assigned importance to agricultural problems, that feedlots present a potential problem, but can be dealt with by effective programs.

Governor Love was followed by presentations from 19 invited speakers and 3 statements entered for the record. A list of speakers and the organizations they represent is attached to this report as Appendix 1. The evening session included 11 speakers and 6 statements entered for the record. A list of these speakers is also included in Appendix 1.

Mr. Baise closed the public session by summarizing that based on the numerous testimony, runoff from feedlots appear to present three possible major problems:

- (1) Oxygen depletion
- (2) Pathogenic bacteria
- (3) Increased nutrients

He continued his summary by stating that there appear to be a few solutions, but that some are in the primitive stage. One feasible solution emphasized by some speakers is the return of wastes to the land. The final point in the summary was that based on the statements presented before the Board, methods of control may be costly and difficult.

FRIDAY, OCTOBER 29, 1971

The Board met in executive session convened at 9:00 a.m. by Acting Chairman William Erwin. The meeting was **opened** by a presentation by the General Electric Company on a process the company has developed for conversion of cattle waste into bacterial protein. The process is one of several being developed for reuse of cattle wastes.

During the executive session, several Board members expressed disappointment on the lack of monitoring data in the States visited and the general dearth of information on the impact of feedlot runoff on water quality. Accordingly, the Board decided that it could not develop worthwhile recommendations at this time and should delay such action and the issuance of a report until completion of its second meeting on animal wastes. However, the Board reached ten preliminary conclusions based on its four day study. These conclusions are included in this report as Appendix 2.

The Board unanimously agreed that the second meeting should be held at a University which is **prominent** in the field of agricultural research and has data available on animal wastes as they relate to water quality. It was also agreed that more technical experts in this field be invited to testify before the Board rather than the public at large. The Board adopted resolutions on strip mining and Federal support for research (Appendix 3).

The meeting was followed by a press conference where the Board presented its ten preliminary conclusions. Mr. Erwin adjourned the meeting at 12:00 noon.

SECOND MEETING, JANUARY 24-28, 1972, ILLINOIS, INDIANA, PURDUE UNIVERSITY

MONDAY, JANUARY 24, 1972

The opening session was held at the Sheraton-Rock Island Motor Inn, Rock Island, Illinois and was convened by Mr. Gary H. Baise, Acting Chairman. Board member, Mrs. Louise Rome, was appointed as Vice Chairman. Mr. Baise opened the meeting by introducing the Board members. Board members present were: Dr. Melbourne R. Carriker, Woods Hole, Massachusetts; Mr. William D. Farr, Greeley, Colorado; Mr. Ray W. Ferguson, Ontario, California; Dr. Wallace W. Harvey, Jr., Manteo, North Carolina; Mr. Byron P. Jordan, New Orleans, Louisiana. Board members not present were: Mr. Thomas W. Gleason, New York, New York; Mr. Irvan F. Mendenhall, Los Angeles, California; and Mr. Parker E. Miller, North Redington Beach, Florida.

Mr. Baise explained that this meeting was a follow-up to the first session held in Denver on the impact of animal wastes on water quality and will cover the States east of the Mississippi River. He stated that he hopes results of the two meetings and the tours will enable the Board to formulate significant recommendations to the Administrator.

The first speaker on Monday morning was Mr. Francis T. Mayo, EPA Regional Administrator, Region V. Mr. Mayo welcomed the Board and outlined the differences between the western and eastern United States in the area of animal agriculture. In summary, these differences are:

1. Land ownership - A majority of the land is Federally owned in the west.
2. Climate, particularly rainfall.
3. Number of animals and size of farms.
4. Differences in technology and land management practices.

Mr. Mayo pointed out that all of these factors affect the impact of agricultural runoff on water quality.

The second scheduled speaker was Dr. Samuel R. Aldrich, member, Illinois Pollution Control Board. Dr. Aldrich was taken ill and could not attend the meeting. However, he entered a prepared statement for the record which helped the Board recognize the transition from the problems of the arid region where the previous Board meeting was held to a more humid region with a different type of agriculture. He explained that (1) the net amount of water that runs off the soil is 3 to 10 times greater in the central Cornbelt than in unirrigated areas of the western Great Plains; (2) the Cornbelt area has far more water to receive and assimilate BOD material than equal areas in the Great Plains; (3) the western areas have mainly beef cattle with dairy cattle and sheep important locally, while in the Cornbelt hogs are the most important livestock, beef cattle

are second, dairy cattle third (first in the Lake States north of the Cornbelt), poultry and sheep rank far behind; and (4) the Cornbelt is characterized by a large number of small operations. Dr. Aldrich, who is a professor of soil fertility on leave from the University of Illinois continued by emphasizing that agricultural practices must be evaluated in terms of (1) effects on long-term soil productivity; (2) degree of impact on the environment locally, nationally, and internationally; (3) effects on amount, quality and cost of food; and (4) economic impact on farmers. Dr. Aldrich's prepared text concluded by stating that there is a misleading concept that animal wastes are equivalent to wastes from 10 billion humans. His statement pointed out that there is a difference in that a high proportion of animal wastes are either dropped by livestock or are spread on the land. Thus most of the decomposition of the organic fraction occurs on or within the soil. The nutrients are largely used in plant growth or are filtered out by the soil. In contrast, a high proportion of human wastes is intentionally introduced into surface waters following varying amounts of treatment.

Mr. Don Jedele, Professor of Agricultural Engineering, University of Illinois Extension Service presented a brief introduction to the tour sites to be visited by the Board. The Board departed by chartered bus for three relatively small farms enroute to an afternoon meeting in Peoria, Illinois.

1. Dale Richmond Farm, Rio, Illinois.

Mr. and Mrs. Richmond are operators of a small confined beef operation. In 1962, Mr. Richmond received an official complaint from the State's Attorney's Office regarding manure being flushed from his open feedlot into a nearby stream through natural drainage. With technical assistance from the local and State Extension Service on alternatives, Mr. Richmond constructed a covered feedlot in 1964 at a cost of \$9,072. This solved the runoff problem, but the system is costly to maintain. In 1970, he added a totally slotted floor building with manure handled as a liquid and no bedding required. This structure cost \$93/head capacity. The briefing of the Richmond operation was presented by Mr. Don Teel, Extension Advisor, Knox County, Galesburg, Illinois who expressed the opinion of the County Extension Service that Mr. Richmond has had a serious animal wastes problem regarding stream pollution, but has successfully solved it at his own expense.

2. Ned S. Brown Farm, Warren County near Galesburg, Illinois.

Mr. Brown operates a hog farm which farrowed 280 litters in 1971 and marketed 1,730 head. The farm is currently in the process of converting from farrow to finish in the field to total confinement. The shift is being accomplished in three steps:

- a. Constructed 30 sow farrowing house in 1969. Totally slotted floors with manure handled as liquid.
- b. Nursery building constructed in 1970. Totally slotted floors-liquid manure.
- c. Now in process of studying best way to change finishing facility to meet today's EPA regulations.

The latter area is where the problem exists. The farm is currently using buildings and concrete floors formerly utilized by a cattle operation causing a problem of runoff of semi-solid manure from finish floor.

The farm operator and manager have sought advise from the Department of Agriculture Rural Environmental Assistance Program (REAP). Their advice was to construct a 90 ft. by 20 ft. by 6 ft. concrete tank at a cost of \$19,200. This structure is to handle wastes from 500 head of hogs from approximately 100 pounds to market weight. Maximum cost-sharing through REAP would be \$2,500. This alternative is deemed economically unfeasible by the farm management. They are presently seeking other alternatives and expressed the hope that engineers at the University of Illinois would be able to assist through their research program in animal waste management.

3. Fred Rosenbohm Farm, Peoria, Illinois

This is a dairy farm and was discussed by Mr. George Perisho, Extension Advisor, Peoria County. A farm pond provides an adequate source of water for the dairy herd. A terrace was constructed to prevent field and lot drainage from entering the pond. This has also prevented siltation. Manure from the loafing barn, paved feedlot, and holding area is spread on crop acres daily. Gutters on the buildings reduce the amount of water flowing across the paved lots. Water from the lots and holding area flows into a natural drainage way. Drainage from the milk room and milking parlor is handled by septic tank and disposal field. Some difficulty has been encountered with grain, straw, and manure from the milking parlor clogging the septic tank and drainage tile. In summary, this dairy is operated as a family farm and has not encountered any serious problem to date.

In the afternoon, the Board met at Jumer's Castle Lodge, Peoria, Illinois. The first speaker was Mr. Carl T. Blomgren, Manager, Standards Section, Division of Water Pollution Control, Illinois Environmental Protection Agency. Mr. Blomgren said his agency is preparing recommendations on animal waste standards for the Illinois Pollution Control Board. He also pointed out that animal wastes constitute a potential water pollution control problem and that one cow or steer produces as much waste daily as 16 humans, a hog or sheep as much as two, and seven chickens as much as one. He explained that unless this concentration of animal wastes on many farms is handled properly, it can contaminate groundwater supplies or runoff into streams and lakes. Economic studies indicate that for many farmers the cost of spreading animal manure on their fields no longer is competitive in price with chemical fertilizers.

The second and final speaker on January 24 was Dr. Roy Van Arsdall, Professor of Farm Management, Department of Agricultural Economics, University of Illinois. Dr. Van Arsdall stated that more complete and detailed information on waste management systems is needed before pollution problems and solutions can be fully evaluated. He outlined some of the impediments to pollution abatement. Among these are uncertainty and lack of knowledge, diseconomies of small size of farms and lack of economic incentives. He pointed out that money lenders are not too favorably inclined toward the small farms since they feel it is not a good investment. This means that the small farmer's financial assistance is derived primarily from the Farmer's Home Administration and REAP which in Dr. Van Arsdall's opinion is grossly underfunded. He concluded by offering the following recommendations to minimize impact of installing pollution control measures on the small farmer:

1. Continuing research and education.
2. Cost sharing.
3. Additional funding for REAP.

In the evening the Board departed by chartered aircraft for Warsaw, Indiana.

TUESDAY, JANUARY 25, 1972

Mr. Baise opened the meeting at the Warsaw, Indiana Holiday Inn by restating that the Board's objectives are to determine whether animal wastes cause water pollution.

The Board was then welcomed by Dr. R. L. Kohls, Dean, College of Agriculture, Purdue University, and a pre-tour briefing was provided by Mr. Robert L. Hogue, Indiana State Poultry Association, Purdue University. Board member Mr. Irvan F. Mendenhall joined the meeting at this time.

The Board proceeded to tour three farms in Kosciusko County near Warsaw to view animal waste disposal systems. The first farm visited was Ernest Rhodes and Sons, a hog operation. There, the Board observed new construction of manure containment facilities which have been approved by the Indiana Water Pollution Board. The second stop was the Triple "T" Farms to view a poultry operation featuring a high rise laying hen building with modern exhaust facilities. The final stop was at Tinkey Farm, Inc., another poultry operation. The Board learned that due to an equipment accident at the Tinkey Farm on September 20, 1971, an estimated 145,000 gallons of poultry waste had runoff into the Tippeconoe River causing a fish kill. It is important to note that the Board's primary interest was to study the Tinkey waste disposal methods not to investigate the fish kill which is a State responsibility.

Following the morning tour, the Board met in Mentone, Indiana. The first afternoon speaker was Mr. Norbert J. Moeller, Dairy Specialist, Purdue University Extension Service who presented a series of slides showing three Indiana dairies with potential water quality problems. However, Mr. Moeller emphasized that the dairy industry does not present a major problem in Indiana and he views it as a decreasing problem in the future.

Dr. Alvin C. Dale, Department of Agricultural Engineering, Purdue University presented a talk on Farm Animal Waste Research and Management in Indiana. Among the highlights of Dr. Dale's presentation were recommendations for additional research particularly on the effects of continuously placing various quantities of wastes on crops and soils, methods for control of odors of animal production units, and more complete farm animal wastes treatment and disposal systems to demonstrate how such systems may be adopted to animal production units.

The final speaker was Mr. Oral H. Hert, Director, Division of Water Pollution Control Indiana State Board of Health. Mr. Hert reviewed the functions of the Stream Pollution Control Board and pointed out that Indiana was one of the first two States for which water quality standards were approved under the Federal Water Quality Act of 1965. With regard to animal wastes, he acknowledged that it has been difficult to relate such wastes to the condition of the State's waters, however, Mr. Hert stated that the potential organic pollution load from confined animal feeding operations does pose a threat of pollution of receiving waters, but that with good design, construction, and management of operations the pollution threat can be minimized. He suggested that dissemination of information and education of existing and potential operators can be of much assistance; however, it will be necessary for regulatory agencies to provide surveillance and contact with the operators in order to keep them aware of their obligation to maintain waste water control facilities and operation on a par with regular farm practices.

WEDNESDAY, JANUARY 26, 1972

The Board met in public session which was convened by Vice Chairman Mrs. Louise Rome at Purdue University. The entire day was devoted to testimony before the Board by experts on the relationship between animal agriculture and water quality.

After a welcome from Purdue's President, Dr. Arthur G. Hansen, the Board heard from Dr. Patrick G.H.J. Bosley, Balaton, Minnesota, physician and Lyon County health officer, who showed slides of farms and municipalities discharging livestock and human waste directly into streams and lakes. He also showed slides where proper sewage management did not contaminate water. He told the Board, Minnesota's laws were not strong enough or

Sufficiently enforced to control pollution and that the money needed for research and implementation of waste management measures was not available. Dr. Bosley said he thought many farmers were at the limit of their finances to solve the problem and that Federal aid was needed.

Dr. Marvin T. Beatty, Chairman, Environmental Resources Unit, University of Wisconsin reviewed Wisconsin's proposed regulations and their implications for small scale farmers. Dr. Beatty said economic studies are needed at once to define more explicitly the costs which these proposed rules entail and what kinds of farm enterprises must bear them. He told the Board research also is needed on several aspects of animal waste management -- in the animals, in the barns and enclosures, in storage, on and in the land and in developing new methods of controlling odors and of recycling and/or other new uses of wastes. Dr. Beatty concluded by asserting that if the proposed Wisconsin rules are enacted in their present form and enforced, the quality of the State's waters would benefit substantially.

Dr. E. Paul Taiganides, Professor of Agricultural Engineering at the Ohio State University told the Board there is a need to develop through research and demonstration projects, a waste management technology that is suitable for the size of farming operations that will be observed in the future. Despite trends towards concentration, the average farming operation will remain too small to support its own research and development program he continued. The EPA therefore should continue to support and expand these programs, he suggested. Dr. Taiganides further recommended that there be expanded programs of monitoring quality of water running off land on which large quantities of manure have been spread. He added that livestock producers should receive direct financial assistance within the next five or ten years to help them comply with anti-pollution laws and regulations.

Mr. Lynn R. Shuyler, EPA, Project Leader, National Waste Research Center, Ada, Oklahoma explained to the Board that the objective of the program is to provide an array of technically and economically efficient waste management alternatives for feedlot operators. Major program areas in the future, based on current trends in the animal feeding industry, plus completed and continuing research and public environmental awareness, should be in two principal areas, he asserted:

- (1) Research, development and demonstration of waste management processes applicable to most current feedlot designs.
- (2) Research, development and demonstration of waste management processes applicable to enclosed feedlots with partial and total environmental control. He made the following recommendations:
 - (a) Coordination of the animal waste research efforts of all governmental agencies, universities and private research groups should be established. Since this research is primarily pointed at protecting the environment, it would

appear logical to make this the responsibility of EPA.

- (b) If proposed national environmental goals and deadlines are enacted into law, massive increases in animal waste research and demonstration program appropriations will be necessary.

Dr. Raymond C. Loehr, Professor of Civil and Agricultural Engineering, Cornell University outlined needs to be considered in establishing immediate and long range approaches to animal waste problems. No single treatment system or approach is likely to be satisfactory for waste management at all animal production operations he said. The land has and will remain an acceptable disposal point for treated and untreated animal wastes under good crop or land management practices, Dr. Loehr added. He concluded by stating that while considerable research has been conducted delineating characteristics of animal wastes and the fundamentals of treating these wastes, projects to demonstrate feasible treatment processes are urgently needed.

Reviewing the animal waste situation in the southeastern United States, Mr. Lee A. Mulkey, Agricultural Engineer, EPA Southeast Water Laboratory, Athens, Georgia, described the poultry and catfish industries in that area and their impact on water quality. Spreading poultry wastes on land is the most common system of disposal in the southeast, Mr. Mulkey told the Board. Lagooning has been adopted sparingly and some of the larger producers have installed dryers, he added. He explained warm water fish farming is expanding as a result of increases in production of channel catfish; catfish are grown in ponds, cages, raceways, and tanks. However, raceways are emerging as the most desirable system; some of these can produce 100,000 pounds of fish per surface acre. Mr. Mulkey summarized by emphasizing that the catfish industry offers pollution control agencies the unique opportunity of developing pollution control technology around the concept of minimum discharge for an industry in its infancy.

Dr. J. Ronald Miner, Associate Professor of Agricultural Engineering, Iowa State University suggested that the Board be skeptical of simple answers which ignore the complexity or exaggerate the magnitude of the livestock waste problem. Dr. Miner said it seems reasonable to consider regulation of livestock wastes at the most local level possible (States) with guidelines and support activities from the Federal government. He stated that there is evidence that land grant university researchers supported in part by the solid waste and water quality agencies have been successful in solving many of the animal waste management problems. However, Dr. Miner is apprehensive that EPA might curtail funding of unsolicited research grant applications and exercise additional control over the type of work to be done. Such moves, Dr. Miner added will result in a less rapid and less efficient program of improved environmental quality.

Mr. Will LaVeille, Agricultural Waste Specialist with the EPA Chicago office praised the efforts of the Cooperative Extension Service in Illinois and Indiana in helping farmers solve their pollution problems. However, he noted that the more marginal farmer or the farmer who knows he has a problem but cannot afford to solve it will probably not contact the Extension people and they in turn may not know of a potential pollution situation. The highlight of Mr. LaVeille's testimony was his assertion that simple remedial measures are now available to abate 95 per cent of the usual animal waste situations and that most water quality problems could be avoided by simple containment and runoff control techniques. He termed imperative monitoring of streams in rural watersheds and said "surveillance efforts should be stepped up in the outlying areas." Application of manure to the land should be considered with great care, he told the Board, since even on relatively flat land a large amount could be lost through runoff.

The public meeting was concluded by a brief address by the Honorable Edgar D. Whitcomb, Governor of Indiana who welcomed the Board and emphasized that the State was making significant progress in solving its water pollution control problems.

THURSDAY, JANUARY 27, 1972

The Board met in executive session chaired by Mrs. Rome to formulate recommendations to the Administrator, EPA as a result of its two meetings on the relationship between animal wastes and water quality.

Before beginning its deliberations, the Board heard a statement from Mr. John George, EPA, Office of Solid Wastes Management, Cincinnati, Ohio. Mr. George asserted that the EPA agricultural waste management program needs to be given greater priority and is presently understaffed and underfunded. He made a number of recommendations to improve the program including a reorganization of the present EPA structure on agricultural waste management.

The Board commended Mr. George for his frank statement, but it was the consensus that the Board should not inject itself into EPA's internal organization. However, several of his other thoughts were incorporated in the Board's final recommendations to the Administrator (Appendix 4).

FRIDAY, JANUARY 28, 1972

The Board held a press conference at Purdue University to present its findings.

The Board meeting was officially adjourned at 12:00 noon.

PROGRESS:

Subsequent to the Board's two meetings, the EPA has implemented the recommendations wherever possible. However, in most instances additional resources will be required for full implementation, particularly in the areas of research, development and demonstration. The EPA has requested significant increases in funds for these programs for Fiscal Years 1973 through 1975.

Respectfully submitted,

Alan Levin

Alan Levin, Executive Secretary
President's Water Pollution Control
Advisory Board

PRESIDENT'S WATER POLLUTION CONTROL ADVISORY BOARD
October 28, 1971 - Denver, Colorado

SPEAKERS PRESENT FOR PUBLIC MEETING

Governor John A. Love, Colorado

John A. Green, Regional Administrator
Region VIII, EPA

Dr. T. C. Byerly, Assistant Director,
Science & Education, Office of Secretary
U.S. Department of Agriculture

Dr. Chester E. Evans, Chief
Northern Plains Branch
Agricultural Research Service
U. S. Department of Agriculture

Dr. Raymond Johnson, Chief
Office of Environmental Quality
Fisheries and Wildlife
Department of Interior

Mr. Tom W. Ten Eyck, Chairman
Water Pollution Control Commission
Colorado Department of Health

Mr. Elvie Dreeszen
Iowa Water Pollution Control Commission

Mr. Richard Bueermann, Executive Officer
California Regional Water Quality Control Board

Mr. Ted Reeves, Chairman
Nebraska Environmental Control Council

Dr. Frank Baker, Chairman
Animal Science Department
University of Nebraska

Mr. Girdner Crofoot
American National Cattlemen's Assoc.

Mr. A. L. Black
National Assoc. of Conservation Districts
Friona, Texas

Mr. Don F. Magdanz, Executive Secretary
National Livestock Feeders' Assoc.

Mrs. Peggy Albers, State Water Chairman
League of Women Voters of Colorado

Mr. Clifford G. McIntire, Director of Natural Resources
American Farm Bureau Federation

Mr. Dean R. Kittell, Administrative Officer
Colorado Farm Bureau

Mr. Mons Teigen, Executive Director
Montana Stock Growers Association

Mr. Harvey Wilhelm, Mountain Empire
Dairyman's Association
National Milk Producers Federation

Dr. Duane Flack, Manager
Monfort Feedlots, Inc.

Dr. J. D. MacKenzie,
Professor of Engineering
School of Engineering and Applied Science
University of California at Los Angeles

Mr. Virgil Huseman, Director
Cattle Feeders' Service
Kansas Livestock Association

Mr. Neil Skau, Jr.
Executive Vice President
Colorado Cattle Feeders' Association

Mr. Lynn Stalbaum, Assistant to General Manager
Associated Dairymen, Inc.

Mr. Jack K. Smith, Executive Secretary
Missouri Water Pollution Board

Mr. Emory G. Long, Administrative Coordinator
Texas Water Quality Board

Mr. Tom Hovenden, Sec. Manager
Idaho Cattle Feeders' Association

Mr. Myron D. Paine, Regional Extension Specialist
Feedlot Waste Management, Agricultural-Eng. Dept.
Oklahoma State University

Mr. Gerald Clary, Ext. Specialist in Beef Cattle
Kansas State University Extension

Dr. Dan M. Wells, Director
Texas Technology University
Water Resources Center

Mr. John Madden
Water Resources Institute
South Dakota State University

Ms. Kay Collins, Treasurer
Colorado Open Space Council

SPEAKERS NOT PRESENT, BUT ENTERED STATEMENT FOR THE RECORD

Mr. Clyde Bower, Chief
Regulatory Services
Oklahoma Department of Agriculture

Mr. Nicholas Pohlit, Executive Director
National Environmental Health Association

Mr. Robert Steffen
Quality Environment Council of Nebraska

Mr. Ray Obrecht, Master
Colorado State Grange

Mr. Charles Hanavan, Jr.
Vice President
Rocky Mountain Farmers' Union

Mr. Frank H. Lewis, President
Texas & Southwestern Cattle Raisers Association

Mr. Elton L. Berck, State President
Farmers Union of Nebraska

Dr. Richard E. Marland, Interim Director
Office of Environmental Quality Control
State of Hawaii

Mr. James P. Behlke, Executive Associate Director
Department of Ecology
State of Washington

Preliminary Conclusions

Relationship Between Livestock Animal Wastes and
Water Quality

The President's Water Pollution Control Advisory Board

October 29, 1971

The President's Water Pollution Control Advisory Board met October 26-29, 1971, in Denver, Colorado, and took subsidiary tours by motor bus and aircraft into portions of Colorado, Nebraska, and Kansas.

After on-the-ground inspections and from having had the benefit of the advice and experience of governmental officials, representatives of agricultural and related industries, and segments of the public, as expressed in an open meeting, members of the Board have reached the conclusions which follow with respect to water pollution resulting from livestock feedlots:

1. Since only eight States have specific feedlot statutes and/or regulations which require registration of confined feeding operations, necessary controls and restrictions on feedlot pollution must be approached at the present time through applicable water quality standards now in effect in all States. At this time, confined feeding facilities can be legally constructed in 29 States without prior consent of a State agency if the waters do not leave the premises under conditions less than an unusual (10 year) rainstorm.
2. Due to mounting demands, reduction in the numbers of farms, and smaller numbers of people in the agricultural labor force, increasing numbers of livestock are being produced on feedlots which concentrate and consolidate problems of waste disposal and control of water, air, and odor pollution.
3. In the 17 contiguous western States, feedlot pollution problems are greatest in the cattle industry, with those involving sheep, swine, and poultry of lesser magnitude.
4. Potential pollution from these sources affects surface waters to degrees which vary widely with the amount of precipitation, grades of land elevation, climatic conditions including temperature, and other factors, including soil structures and their absorbent qualities.

5. Pollution originating in livestock feedlots unless properly controlled, can exhaust oxygen supplies and kill aquatic life, accelerate eutrophication, contaminate water with public health hazards, and create insect and odor nuisances. Dust from feedlots, under certain conditions, pollutes air resources. Volatile nitrates can become airborne to affect distant land and water areas. Animal wastes can be contributors to water-borne pathogens.
6. There are many feedlots which will have to install better runoff controls and solid waste management to be in compliance with State laws on feedlot management now in existence or soon to become effective.
7. In areas of low rainfall some control measures can be reasonably simple to design and install when compared to controls required of municipal and industrial pollution sources, through the use of techniques such as interceptor ditching, lagoons, land and terracing disposal.
8. Opportunities may exist to use animal waste products for beneficial purposes such as gasification, recycling or animal feeds, and conversion to a combustible oil.
9. This Board is in agreement with those principles and objectives of the U. S. Department of Agriculture Rural Environmental assistance Program which further water quality objectives in the United States.
10. Formulation of regulations should be as consistent, constant and durable as possible in view of the evolving technology that demands some recurring change.

RESOLUTIONSSTRIP MINING

WHEREAS, strip mining methods ravage the lands and frequently result in significant problems of water pollution, particularly related to siltation and sedimentation and acid drainage; and

WHEREAS, much of the coal presently being mined by the strip-mining methods is utilized by the electric industry which is increasing year by year; and

WHEREAS, the reclamation and rehabilitation of strip mined areas is a major problem in many states;

NOW, THEREFORE, BE IT RESOLVED THAT THE President's Water Pollution Control Advisory Board, meeting October 29, 1971, in Denver, Colorado, hereby urges Federal agencies to support proposals before the Congress which would establish a Federal system of standards for strip-mining methods which the States would be required to meet, with operators being required to do an effective job of reclaiming lands as they mine them; and

BE IT FURTHER RESOLVED that this Board expresses its approval and endorsement of a Federal program whereby the government could acquire and reclaim lands which have already been ruined, possibly utilizing to the greatest extent possible, the opportunities to utilize sewage sludge in these efforts.

FEDERAL SUPPORT FOR RESEARCH

WHEREAS, livestock operators urgently need practical processes for the economical treatment and/or disposal of manures; and

WHEREAS, many poultry farmers are faced with similar problems; and

NOW, THEREFORE, BE IT RESOLVED that the President's Water Pollution Control Advisory Board, meeting in Denver, Colorado, October, 29, 1971, hereby recommends that the Administrator of the Environmental Protection Agency assume the responsibility for insuring that consideration is given to Federal funding for research into:

1. Developing methods for the economical and practical treatment and/or disposal of livestock and poultry manures which must fully protect both surface and ground water from all types of pollution with emphasis on preventing the release of soluble inorganic minerals into the soil, including, but not limited to, nitrates, chlorides, total hardness, etc.

STATEMENT ON THE RELATIONSHIP
BETWEEN ANIMAL WASTES
AND WATER QUALITY

The President's Water Pollution Control
Advisory Board

January 28, 1972

INTRODUCTION

In late 1971 and early 1972, the President's Water Pollution Control Advisory Board undertook a review of problems relating to pollution of water resources by animal wastes. The Board toured agricultural areas in Colorado, Nebraska, Kansas, Illinois, and Indiana and conducted meetings to receive testimony from experts in related disciplines and interested citizens representing a cross section of the Nation. In addition, the Board considered recommendations developed by a National Symposium on Animal Waste Management and by workshops conducted by several academic institutions. Therefore, these observations and conclusions are based upon information from this wide variety of sources.

Water resources are of incalculable value to the health and well being of all citizens. They are sources of supply for domestic and industrial purposes, for irrigation and other agricultural uses, for recreation, for navigation, and for power generation. Pollution damages or destroys the value of water for many of these beneficial purposes.

In a broad sense, water resources are polluted by direct discharges from point sources such as municipal treatment plants and industries, and by runoffs from land areas which are both point and non-point sources, and even by airborne contaminants. Animal wastes, resulting principally from concentrations in confined areas of agriculture-related operations, are involved in pollution of water resources mostly through runoffs. In addition, under certain circumstances, animal production can contribute to air pollution.

Animal wastes constitute both real and potential hazards to public health, and result in kills to aquatic life as well as damages to recreational and aesthetic values.

The Water Pollution Control Advisory Board has investigated many aspects of the overall water pollution situation and considered the problems associated with animal wastes in comparison to those resulting from other sources. Consequently, the following conclusions reflect collective judgments of Board members on animal waste pollution in relation to the overall national water pollution problem.

I. Severity of the Problem.

While localized difficulties clearly exist, identified animal waste management problems do not yet approach the scope and magnitude of water pollution originating from municipal and industrial sources, or even from soil erosion. However, the potential pollution from animal waste sources is growing in magnitude as the number of livestock, poultry, and fish increase and are fed in greater numbers in confinement situations which concentrate waste materials. Consequently, it is urgent that the nation exert major efforts to control animal waste pollution before the situation becomes critical.

Recommendations

That the Environmental Protection Agency assume a vigorous leadership role in coordinating major activities of all Federal, State and local agencies involved in agricultural waste management with those of educational institutions and private groups and individuals interested in solving animal waste disposal problems. To aid in this effort, EPA must be provided with more funds and expanded staffing to coordinate its own programs in research, training, administration, and management.

II. Agricultural Concerns.

Anxiety is widespread among members of the agricultural community about what may be required of animal producers in pollution control measures and activities. While some of this anxiety stems from uncertainties relating to new and changing requirements and is to some degree unfounded, there is legitimate concern about costs of installing control systems.

Recommendations

That the Environmental Protection Agency join with the appropriate Federal and State agencies and education institutions in developing and implementing a comprehensive public information program to explain fully the evolving guidelines and means of achieving effective pollution control measures necessitated by animal waste disposal problems.

III. Financing Pollution Control.

Some segments of the agricultural community are firm in their belief that the Federal Government should participate to a material degree in cost-sharing the financing of projects. As a matter of principle the Board regards animal producers in the

same light as privately owned industries, or businesses which must secure their own financing for pollution control facilities and receive reimbursement through increased prices of foods paid by the consuming public. However, the Board believes that the agricultural community should be accorded the full cooperation and assistance of Federal and State agencies in the form of technical assistance based upon effective research and development efforts.

Recommendations

That the Environmental Protection Agency seek added appropriations for expanded research and development programs, so that these costs can be held to minimum levels to the farmer. Demonstration projects are a very effective educational method that should be increased, which can result in overall reduction in costs to both producer and consumer. In addition, USDA should use all existing programs and technical services to help animal producers install systems that comply with regulations.

IV. Degree of Control.

There appears to be widespread agreement on the general policy that animal wastes should be returned to the soil in such a way as to prevent runoff and to utilize fully the nutrients involved. However, if an animal producer discharges effluents, controlling regulations must require maintenance or enhancement of the quality of receiving waters.

Recommendations

That the Environmental Protection Agency encourage the adoption of State legislation and regulations for animal waste management based on minimal Federal guidelines which will maintain standards with a view to enhancing water quality.

V. Uses of Animal Wastes.

The Board believes that recycling animal wastes back onto the land is the best practicable approach in most situations, particularly for smaller operators, through the use of catchment basins, lagooning systems, and/or solid waste handling techniques. There are also other possible uses which should be given full consideration. Testimony presented to the Board indicates that promising possibilities exist in converting animal wastes into fuels such as oil or gas, building materials, dry fertilizer, tires, etc., and in recycling back into animal feeds.

Recommendations

That the Environmental Protection Agency give high priority to funding for research and development projects which may develop practicable and safe alternate uses for animal wastes.

VI. Public Health.

Testimony presented before the Board reveals a dearth of information in many critical areas of concern. Not nearly enough is known about the possible transmittal of viruses, other pathogens and toxic chemicals, through animal wastes, or the possible contamination of groundwater supplies, or the affects of runoff of pesticides or other agricultural chemicals, or the concentration of pesticides and toxic chemicals in animals from recycling.

Recommendations

That the Environmental Protection Agency initiate cooperative long range research projects in centers of excellence which will result in the collection of reliable data upon possible less evident ill effects of concentrations of animal wastes.

VII. Monitoring.

Monitoring and tracing noxious substances in surface and groundwater is grossly inadequate in most States.

Recommendations

That the Environmental Protection Agency, through program grants or otherwise, encourage State agencies to increase their monitoring programs so that an adequate profile of State water quality by stream basins and groundwater would be available in order to easily identify problem areas.

VIII. Site Selection.

Particularly vexing water quality problems were observed by the Board, which were related to specific sites used for animal production. Many of the difficulties could be minimized if proper site selection criteria, including climatologic and geologic conditions, were developed for implementation by the animal production industry. Additional waste management demands are created by urban encroachment into agricultural production areas.

Recommendations

That attention be given to the development of national and/or State site selection guidelines which will determine the best land areas to be used for animal production to minimize water pollution.

IX. Training.

The Board is concerned about the critical lack of technically competent personnel who have knowledge of not only agricultural problems but, more importantly, of the environmental systems as well. The supply of such personnel must be increased to meet the nation's mounting needs for technical expertise in various disciplines relating to water pollution, control, including agricultural sources.

Recommendations

That the Federal Government encourage educational institutions and State and local agencies through grants and/or other incentives, to expand their graduate and undergraduate training programs in the environmental agricultural areas, which will direct expert manpower into the pollution control field.

X. Uniformity.

Federal guidelines should be promulgated and applied as minimum standards to all States, and should be the basis for water pollution controls and restrictions on animal waste management.

Recommendations

That the Environmental Protection Agency should develop animal waste guidelines and work as closely as possible with the States to ensure that these basic minimum requirements be adopted nationwide in the interest of uniformity which prevents discrimination against any particular group or individual.